

DESCRIPTIONS AND BIOLOGY OF SOME NORTH AUSTRALIAN  
TERMITES.

By GERALD F. HILL.

(Plates xxiii.-xxv. and forty-one Text-figures.)

[Read 31st May, 1922.]

The present paper contains descriptions of four new species and two hitherto undescribed castes of North Australian Termites of the genera *Eutermes* and *Hamitermes*, in addition to miscellaneous references to other and better known species.

In my studies of termites I have been fortunate in enlisting the cordial assistance of several well-known authorities in this group to whom I wish to extend my grateful thanks. Professor Sjöstedt has very kindly presented me with a nearly complete set of Dr. Mjöberg's Australian species and many papers. The former has been almost indispensable in working out closely allied species. To Professor Nils Holmgren I am indebted for literature and a very large collection of termites, including many species from the Malayan and Australian Regions. I am further indebted to him for the identification of many specimens. From Professor S. F. Light, Dr. T. E. Snyder and Reverend Father Wasmann I have received valued assistance in the form of literature and specimens.

The types of new species are in the writer's collection. Measurements and colours are recorded as in earlier papers.

*EUTERMES VERNONI*, n.sp. (Pl. xxiii.; xxiv., fig. 1; Text-figs. 1-9.)

*Imago*. (Text-figs. 1-4.)

*Colour*: Head very dark brown, postclypeus and labrum buckthorn brown, a little paler than basal half of mandibles; pronotum auburn, blotched with buckthorn brown, anterior margin darkest, meso- and metanotum buckthorn brown with middle and posterior margin suffused with auburn; wing-veins and tergites of abdomen auburn; wing-membrane brown with anterior margin suffused with yellow ochre.

*Head* (Text-fig. 1) large, hemispherical behind, front concave, clothed rather densely with long and short setae. Fontanelle large, forked anteriorly, in line with the middle of eyes. Eyes very large (.650 x .517) and prominent, finely faceted, their lower margin very near lower margin of head (.094). Ocelli very large (.188) circular, very close to the eyes. Postclypeus short and wide, more

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than twice as wide as long, convex, posterior margin hemispherical, anterior margin truncate. Antelypeus large, hyaline, nearly straight in front. Labrum small, about one-third longer than wide, narrow at the base, swollen on the sides to the conical apex, exposing the two apical teeth of each mandible. Mandibles very large, the teeth black, dentition of usual type. Antennae (Text-fig. 2) 16-jointed, first joint very broad, second nearly cylindrical, a little more than half as wide as first, third as long as second but much narrower, fourth a little shorter and wider than third, fifth longer than third and shorter than fourth, sixth and seventh equal, eighth to sixteenth about equal in length, narrower at base, turbinate at apex.

*Thorax* (Text-fig. 3): Pronotum nearly as wide as head, anterior margin slightly bent up, behind which there is a deep depression on either side midway between the pale median suture and lateral margin, antero-lateral areas rounded, sides sloping to the slightly sinuate posterior margin, clothed as in head. Posterior margin of meso- and metanotum more markedly sinuous than that of pronotum.

*Legs* moderately long, very setaceous, claws and spurs slender, spurs 2:2:2.

*Wings*: Wing-stumps short, equal, moderately densely clothed with short and long setae, showing rudiment of subcosta, suture straight. Wings very long, costa and radius very distinct, the former more setaceous than the latter; median vein dark at the base but soon becoming indistinct, with several branches beyond the middle; cubitus with about 12 branches in the forewing and 10 in the hindwing, most of them well-defined and unbranched. Membrane (Text-fig. 4) densely clothed with minute setae and densely and minutely sculptured.

*Abdomen* large, tergites narrow, clothed with long and short golden setae, sternites yellowish, with greyish blotch at either end of the first six segments; cerci very short and broad.

*Measurements*:

Length with wing: ♀ 23.00 mm., ♂ 20.50.

Length without wings: ♀ 12.00, ♂ 10.50.

Head: long 2.44; wide 1.97; deep 0.80.

Antennae (16-jointed) 3.29.

Pronotum: long 1.12; wide 1.88.

Wings: forewings, long 19.00, wide 4.75; hindwings, long 18.00, wide 4.75.

Tibia iii., long 2.29.

Abdomen, wide 3.00 mm.

*Queen*,

Total length 33 mm., width of abdomen 7.9 mm.

*Soldier.* (Text-figs. 5-7.)

*Colour*: Head very dark castaneous, distal two-thirds of snout, back of head and an obscure dorso-median line lightest, proximal one-third of snout darkest (in dried specimens from alcohol the head generally appears uniformly dark); antennae nearly as dark as tip of snout, anterior half of pronotum as dark as head, remainder of thorax and tergites of abdomen brown, the latter giving the body a distinctly banded appearance.

*Head* (Text-fig. 5 and 6): Posterior part large, nearly round, snout nearly as long as rest of head, clothed with scattered long reddish setae. Antennae (Text-fig. 7) 14-jointed, long, third joint equal to, or a little longer than, second, fourth always longer than third and fifth, fifth as long as third, sixth to fourteenth elongate, slender.

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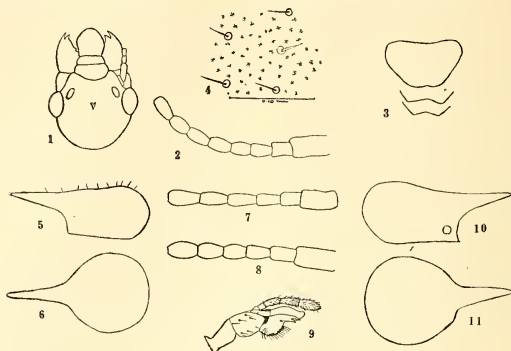
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*Pronotum* saddle-shaped, the anterior half bent up sharply and narrowed to the emarginate anterior margin, bearing very few long reddish setae.



Text-figs. 1-9. *Eutermes vernoni*, n.sp.

- 1-4. Imago.—1. Head; 2. Antenna, proximal segments; 3. Pronotum and posterior margin of meso- and metanotum; 4. Wing-membrane.  
5-7. Soldier.—5. Head in profile; 6. Head, dorsal surface; 7. Antenna, proximal segments.  
8-9. Worker.—8. Antenna, proximal segments; 9. Maxilla.

Text-figs. 10-11. *Eutermes nigerrimus* var. *queenslandicus* Mjöb.

Soldier.—10. Head in profile; 11. Head, dorsal surface. Drawn from a co-type.

*Legs* very long and slender, clothed scantily with long and short reddish setae; tibial spurs 2:2:2.

*Abdomen* short and broad, bluntly rounded at the apex, tergites with scanty fringe of long reddish setae as on thorax.

*Measurements:*

Head: long 1.74—1.83 mm., wide 1.00.

Thorax and abdomen, long 2.72—2.91.

Antennae (14-jointed) 2.40.

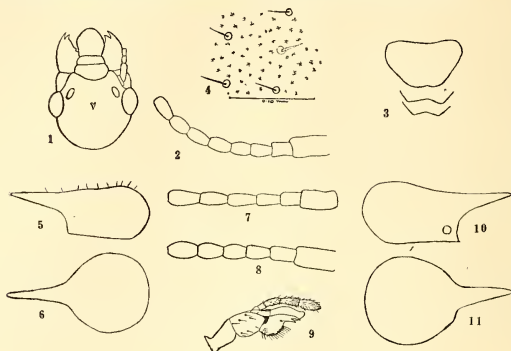
Tibia iii. 1.50—1.60.

Abdomen, wide 0.85.

*Worker.* (Text-figs. 8, 9.)

*Colour:* Head mummy brown above and behind, genae and postclypeus cream, frontal and transverse sutures (Light, 1921) very distinct, pronotum brown, not as dark as head, but darker than tergites of abdomen; remainder of insect whitish yellow.

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*Pronotum* similar to that of soldier; margin with a few long stout setae.

*Legs* long and slender, with scattered reddish setae.

*Abdomen* large, widest in the middle, clothed with scattered long and short setae; cerci short and stout.

*Measurements:*

Total length 6.00 mm.

Head: long 2.00; wide 1.73.

Thorax and abdomen, long 4.00.

Antennae (15-jointed) 2.35.

Pronotum: long 0.47; wide 0.90.

Tibia iii. 1.75.

Abdomen, wide 1.70.

*Affinities.*—The imago is distinguished from *E. palmerstoni*, to which it is evidently closely related, by its much larger eyes and ocelli, proximity of the latter to the former, differently shaped antennae, shorter abdominal tergites (the third segment being 0.61 as against 0.71 in *palmerstoni*), markedly emarginate posterior border of meso- and metanotum (much straighter in *palmerstoni*), and less deeply emarginate posterior border to pronotum. The soldier appears to be nearest *E. nigerrimus* var. *queenslandicus* Mjéb. (Text-fig. 10 and 11) and *E. magnus* Frogg. From the former (alate form not known) it differs chiefly in having smaller and less rounded head, longer and more slender snout and straighter dorsal surface in profile. These differences are slight, but they are at least as well marked as those which separate soldiers of certain allied species which are very distinct in the alate form. The termitaria of these two are so dissimilar that it is not at all likely that they are constructed by individuals of the same species. I have not had authentic examples of *E. magnus* Frogg. for examination, but from the description of the soldiers and Dr. Mjögberg's remarks upon them, they are evidently very similar to *E. vernoni*. The termitaria, too, are evidently very much alike, but the difference in the alate forms is very marked indeed.

*Biology.*

*The termitarium and its occupants.*—The termitaria are to be found in immense numbers on the low treeless or nearly treeless country in the vicinity of Townsville (Pl. xxiv. fig. 1), where they are associated with the mounds of two other very common species, *Hamitermes wilsoni* Hill (H. perplexus Hill) and *Drepanotermes silvestrii* Hill. In shape they are more or less rounded domes, circular at the base and sloping on the sides to the broadly rounded or flattened apex. The sides are often symmetrical, but generally undulating as a result of accretions made from time to time to meet the needs of the increasing colony. The average dimensions of these termitaria are about 2 ft. 6 inches in diameter at the base by 2 feet in height, but they are sometimes more than twice this size. The walls are composed entirely of heavy loamy soil, moulded into a close-textured mass free from the short lengths of grass found in the structures of

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some other *Eutermes*, e.g., *E. palmerstoni*, n.sp. Although thick and compact, the walls may be easily broken down with a light pick, and are often pierced by small animals (? Bandicoots) presumably in search of food. A small bird (*Pardalotus* sp.) also occasionally tunnels into these termitaria for nesting purposes. Within the walls there is a maze of irregular passages and tunnels, some of which are generally tightly packed with short lengths of dried grass, while others are occupied by members of the community (Pl. xxiii., fig. 2). Nearer the middle the passages are more numerous and the dividing walls less substantial. The "nursery" is generally large and occupies the whole of the lower-middle portion of the nest (Pl. xxiii., fig. 1). In it the chambers are more or less horizontal and separated from each other by very thin layers of fragile, brown matter almost entirely vegetable in origin. There is no well-defined queen-cell; the mother termite occupying one of the undifferentiated chambers composing the "nursery" or, very often, one of the large cells near those in which grass is stored (Pl. xxiii., fig. 1). The roofs of the "nursery" cells are generally dotted over with small white spots of fungus growth, which may possibly be used as food. Dejecta are stored in the cells outside the lower part of, and below, the "nursery." Additions to the nest appear to be made generally during the dry season and, when undertaken, are generally extensive. An increase of about 50% in the size of a nest has been observed to take place within a week in one instance, but such rapid building is unusual.

The earthy material used in building is gathered very largely on, or near, the surface, since there are no extensive excavations below it and no trace in the walls or elsewhere of the yellow-coloured subsoil, which underlies the locality in which the nests have been investigated. The main passages from the nest all trend towards the lower part of the walls, under which they pass at a depth of 3 to 4 inches and then divide into numerous radiating passages communicating with the surface, where they are closed excepting at "harvesting" time.

The parents of a new colony live for some time in underground passages, in which they rear a fairly large brood of workers and soldiers only; then, when the community is strong enough, a termitarium is built, and, later (probably 2 years) the first brood of nymphs is reared. I have seen still soft and moist termitaria of about 15 inches in height where none existed a few weeks earlier and, on breaking these mounds open, found them to contain a large number of workers and soldiers only, the king and queen being located in chambers excavated in the soil below. There is no "nursery" in these young termitaria, in fact, this part of the structure is well-defined only in the older ones.

The community invariably consists of an immense number of soldiers and workers, the former approximating the latter in numbers. These castes are associated with vast numbers of young forms in all stages of development, the larger of which may be differentiated as being destined to become workers, soldiers or imagos. A king and queen are nearly always found in some part of the nest, but the former is easily overlooked unless a careful search is made. The queen is not imprisoned within a cell, as is often the case with other species, but wanders through, and oviposits in, any of the larger passages. Of five queens captured on 7th July, only two were located in the "nursery," the others being in passages near the top of the nest and within a few inches of the walls. In each case masses of fresh eggs were found in close proximity, and others not far distant. The eggs hatch in the chambers or passages in which they are laid, but the resulting larvae appear to be carried, or migrate, to the "nursery." Ecdysis has been observed only in the larger worker larvae and nymphs under-

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going their final moult; in these the quiescent stage is passed within the "nursery." The larvae which are destined to develop into imagos, moult about the middle of September, after which the wing rudiments are evident to the naked eye. After passing through another moult, about the middle of November, there is a considerable increase in the size of the body and wing-rudiments. The latter grew rapidly at first, but after attaining a length of 3.0-3.25 mm. there is little further external development in this stadium. Just before the final ecdysis, which occurs between the end of the first and the last week of January, the wing-rudiments, now 3.50 mm. long, lose their creamy colour and become brownish yellow, and the abdomen becomes distended owing to the great increase in the fat-body. The moult which follows is not simultaneous throughout the colony. From the middle of January to about the middle of February there will often be found large nymphs with unpigmented wing-rudiments and others in all subsequent stages of development, up to apparently mature insects. I believe that the latter await the further development of the former and that all subsequently leave the colony together during the first two weeks of February. "Swarming" has not been observed but almost certainly takes place at night. The number of imagos reared by a colony of this species is comparatively small. Probably 50% of the termitaria examined between the months of September and February will be found to contain no nymphs or alate imagos, whilst in the remainder, the complement will range from three to twenty, or an average of about 12 per colony. These figures have been found to agree fairly closely for three successive seasons, with the exception that in one termitarium examined this year (13th January) about 100 nymphs and developing imagos were found.

Neotenic royalties, or the immature forms destined to develop into them, have not been found in this species. I have frequently noted that termitaria from which I had removed the queen were always repaired to a certain extent and then abandoned, whilst those in which the queen was not discovered were soon rebuilt and as prosperous as before. This indicated the inability of these *Eutermes* to exist as a community after the death of the original female parent. In order to decide this question, the queens were removed from three large termitaria on 17th July, 1920, while at the same time three other nests were similarly broken into but not orphaned. About a month later all were found to be sufficiently repaired to protect the inmates from the attacks of predaceous animals and from other dangers. When next visited on 13th January, 1922, the three orphaned nests were found to be quite abandoned, while the others contained prosperous communities. In the case of *Drepanotermes silvestrii* Hill which is found in the same locality, I have been able to show that the loss of the true queen is not such a serious matter, since the survivors thereafter substitute one or more neotenic forms which are capable of producing sufficient young to maintain a colony of considerable, if not of average, numerical strength.

Associated with *E. vernoni* are two other species of termites whose relationship with the host species and with each other is not clear. As a rule when a termitarium is occupied by more than one species, each occupies a definite part of the structure and there is, apparently, no fraternising. In the present instance, however, there are two species living (in the alate form) in the same galleries, and, as far as is known, in perfect amity with their hosts. The smaller of these, a species of *Hamitermes*, has been found twice in occupied nests of *E. vernoni*, and on each occasion associated with the larger species, and once in an abandoned nest—one of the orphaned nests examined on 13th January. The latter were accompanied by their own soldiers and workers,—castes which I could



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not find with the two series of imagos previously taken in nests occupied by *E. vernoni*. The larger species, the generic position of which I have not determined, is of much commoner occurrence in the nests of *E. vernoni* than is the smaller *Hamitermes*. During the period September-February of the years 1919-20 and 1920-21 the nymphs or the alate forms only of this species were taken in many of the nests examined. In most instances they were found with the nymphs or imagos of the host species, according to the period, but in numerous cases they were found in termitaria which contained no other nymphs or imagos. In fact, during those seasons the nymphs or the imagos of the unidentified guest species were more often found than those of the host species and in only two instances were the latter unaccompanied by the former. All attempts to find the soldier and worker castes proved unsuccessful. During the present season (1921-1922) with more leisure at about the "swarming" period and with the assistance of an energetic companion I was able to examine a large number of termitaria, only to find a complete absence of all castes of the unidentified species.

The grass stored in these termitaria is nearly always infested with the larvae, pupae and imagos of a small beetle, which Mr. A. M. Lea has described under the name *Palorus eutermiphilus*. From the same nests Mr. Lea has also identified *Mandalotus geminatus* Lea which, he informs me, is not a true inquiline. The partially abandoned upper parts of the nests often harbour the larvae, pupae and imagos of the Carabid beetle *Gigadema sulcatum* Mael. (identified by Mr. T. G. Sloane) and an unidentified Scarabaeid and Elatrid. The most remarkable inhabitants of these mounds are, however, large Coleopterous larvae which are enclosed by the termites in closely fitting cells in which they are fed and attended by their hosts. I have examples measuring from 15 to 60 mm. in length, but I have not yet succeeded in rearing them to the pupal or adult stage, although I have at the present time living specimens which have been in captivity for two years without food or the attendance of termites. It is intended to publish some notes elsewhere on these insects.

EUTERMES PALMERSTONI, n.sp. (Text-figs. 12-14.)

*Eutermes triodiae* Hill (nec Froggatt), Proc. Linn. Soc. N.S.W., xl, 1915, p. 107.

Queen.

*Colour:* Head very dark brown; antennae, clypeus, and legs buekthorn brown; labrum yellow; thorax, wing-stumps and tergites of abdomen auburn.

*Head* large, posterior margin semicircular to the hind margin of the eyes, front concave; fontanelle large, shaped like a key-hole, in line with ocelli; dorsal surface covered with fine short hairs; ocelli moderately large and well separated from the eyes; eyes large (diam. 0.470 x 0.564) and prominent, finely faceted, the lower margin less than one-third the short diameter from the lower margin of head; post-clypeus moderately large, areolate behind, truncate in front, with fairly distinct median suture; anteclypeus hyaline, large, produced anteriorly in the middle; labrum strongly convex, narrow at the base, swollen on the sides, rounded in front. Antennae 16-jointed, first joint long and stout, second half as long as first and much narrower, third one-fourth longer than second, fourth as long as second, oval.

*Thorax:* Pronotum with anterior margin concave and bent up, lateral areas rounded, sides narrowed to the deeply emarginate posterior border, the whole surface densely clothed with short fine setae, as on head. A clear depression on each lateral area and a larger angular patch behind the anterior margin. Wing-

not find with the two series of imagos previously taken in nests occupied by *E. vernoni*. The larger species, the generic position of which I have not determined, is of much commoner occurrence in the nests of *E. vernoni* than is the smaller *Hamitermes*. During the period September-February of the years 1919-20 and 1920-21 the nymphs or the alate forms only of this species were taken in many of the nests examined. In most instances they were found with the nymphs or imagos of the host species, according to the period, but in numerous cases they were found in termitaria which contained no other nymphs or imagos. In fact, during those seasons the nymphs or the imagos of the unidentified guest species were more often found than those of the host species and in only two instances were the latter unaccompanied by the former. All attempts to find the soldier and worker castes proved unsuccessful. During the present season (1921-1922) with more leisure at about the "swarming" period and with the assistance of an energetic companion I was able to examine a large number of termitaria, only to find a complete absence of all castes of the unidentified species.

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*Thorax:* Pronotum with anterior margin concave and bent up, lateral areas rounded, sides narrowed to the deeply emarginate posterior border, the whole surface densely clothed with short fine setae, as on head. A clear depression on each lateral area and a larger angular patch behind the anterior margin. Wing-

stumps small, equal, covering about half the notum, posterior margin of meso- and metanotum slightly sinuate.

*Legs* moderately long and stout.

*Abdomen* with very distinct tergites, clothed with dense short setae, remainder of abdomen creamy white, glabrous.

*Measurements:*

Total length 33.00 mm.

Head wide 1.97; long 2.35; deep 1.17.

Thorax and abdomen, long 31.00.

Pronotum: long 1.17; wide 1.88.

Tibia iii. 2.82.

Abdomen, wide 9.00.

*Soldier.* (Text-figs. 12-14.)

*Colour:* Head very dark chestnut, base of snout a little darker than rest, a little lighter behind; antennae fuscous; thorax, legs and abdomen lighter, anterior margin of pronotum very dark.

*Head* (Text-figs. 12, 13) large, wide, round behind, snout moderately long and stout, clothed with scattered fine pale setae. Antennae (Text-fig. 14) 14-jointed; very long and slender, first joint long and moderately stout, as long as fifth, second short, about half as long as first and much narrower, shortest of all; third very long and slender, equal to or very little shorter than fourth; fourth, fifth and sixth progressively longer, seventh and eighth equal in length to sixth; ninth shorter than eighth, equal to fourth; tenth to thirteenth inclusive a little shorter than ninth and a little longer than fourteenth.

*Thorax:* Pronotum saddle-shaped, anterior half bent up sharply, very dark, anterior margin rounded, slightly emarginate in the middle, lateral areas narrow and bluntly pointed, posterior margin rounded and slightly emarginate. Mesonotum much narrower than pronotum.

*Legs* long and slender, clothed with short fine setae.

*Abdomen* much narrower than head, tergites with scanty, long reddish setae; cerci long and slender.

*Measurements:*

Head: long 1.88 mm.; wide 1.22.

Thorax and abdomen, long 2.53.

Pronotum: long 0.25; wide 0.65.

Tibia iii. 1.84.

Abdomen, wide 0.95.

*Note:* In some of the tubes there are a few soldiers with smaller and less rounded heads, but otherwise similar. These have heads 1.74 long x 0.98 wide.

*Worker.*

*Colour:* Head dark chestnut, with pale sutures; clypeus, legs and pronotum pale yellow, antennae paler.

*Head* large, rounded, clothed with pale setae; post clypeus convex, about twice as wide as long, arcuate behind, truncate in front; anteclypeus hyaline, with middle of anterior margin strongly produced forward. Antennae 15-jointed, first joint long and moderately stout, second about half as long and much narrower, third very long and slender, fourth long and narrow, but shorter than third.

*Thorax:* Pronotum saddle-shaped, anterior half bent up, emarginate in mid-

stumps small, equal, covering about half the notum, posterior margin of meso- and metanotum slightly sinuate.

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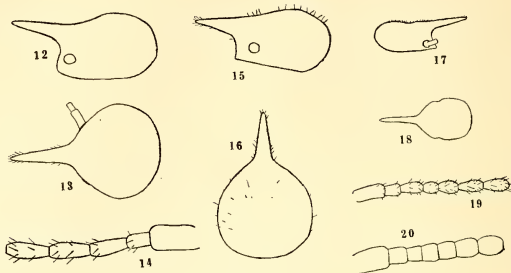
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*Thorax:* Pronotum saddle-shaped, anterior half bent up, emarginate in mid-

dle, lateral areas rounded, posterior border rounded, bearing a few stout red setae; mesonotum narrower and shorter than pronotum; metanotum one-fourth wider than mesonotum, both with a few stout, red setae.



Text-figs. 12-14. *Eutermes palmerstoni*, n.sp.

Soldier.—12. Head in profile; 13. Head, dorsal surface; 14. Antenna, proximal segments.

Text-figs. 15-16. *Eutermes triodiae* Froggatt.

Soldier.—15. Head in profile; 16. Head, dorsal surface. Drawn from a co-type.

Text-figs. 17-20. *Eutermes mareebensis*, n.sp.

Soldier.—17. Head in profile; 18. Head, dorsal surface; 19. Antenna, proximal segments.

Worker.—20. Antenna, proximal segments.

Legs long and moderately slender, not markedly setaceous; abdomen with a few reddish setae on tergites.

Measurements:

Total length 6.00 mm.

Head: long 2.00; wide 1.64.

Thorax and abdomen, long 4.00.

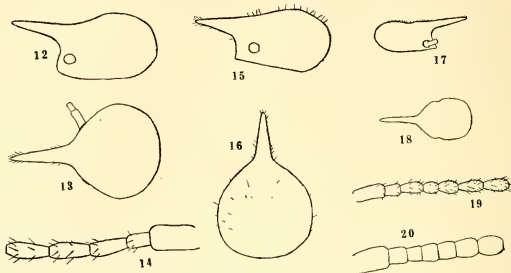
Antennae (15-jointed) 2.35.

Pronotum: wide 0.70; long 0.51.

Tibia iii. 2.16.

Affinities.—The alate form of *E. palmerstoni* is unknown, but the measurements of the queen indicate that it is one of the large species, possibly as closely allied to *E. vernoni*, n.sp. as any other. From the latter it is distinguished, *inter alia*, by the pronotum and size of the eyes. From *E. triodiae* Frogg. it is easily distinguished by its much greater size, darker colour and fewer joints in the antennae. The measurements of Froggatt's species (from a co-type) are as follows:—diameter of eyes .304 x .288, length of head 1.27, width of head 1.08, length of pronotum 0.70, width of pronotum 1.03.

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Text-figs. 17-20. *Eutermes mareebensis*, n.sp.

Soldier.—17. Head in profile; 18. Head, dorsal surface; 19. Antenna, proximal segments.

Worker.—20. Antenna, proximal segments.

Legs long and moderately slender, not markedly setaceous; abdomen with a few reddish setae on tergites.

Measurements:

Total length 6.00 mm.

Head: long 2.00; wide 1.64.

Thorax and abdomen, long 4.00.

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The soldier is similar to *E. triodiae* but the head differs in shape and is much darker in colour (Text-figs. 15 and 16).

In an earlier publication (1915) I described and figured the termitaria and discussed the habits of this species under the name *Eutermes triodiae* Frogg., a species which it resembles only in the soldier caste.

The immense termitaria erected by these termites entitle them to rank as one of the most remarkable of the Australian species, sharing with *Eutermes pyriformis* Frogg. the distinction of building the highest nests of any known species. The latter species is of further interest owing to the fact that, since its discovery by the late N. Holtze over 20 years ago and its subsequent description by Froggatt, it appears to have remained unknown to naturalists. With Froggatt's excellent photographic reproduction of the termitarium and its discoverer's direction to the locality (near Darwin) for guidance I anticipated little difficulty in learning more of the habits of this interesting insect, but all efforts to locate another colony have so far failed. The termitarium figured by Froggatt is evidently very similar, outwardly at any rate, to those of *E. palmerstoni*, which are very common in the vicinity. The possibility that Holtze's specimens were occupants of a part, or whole of a nest originally built by *E. palmerstoni* cannot be overlooked, but his description of the interior of the nest, if correct, indicates a species possessing feeding habits quite distinct from those of the latter species.

EUTERMES MAREEBENSIS, n.sp. (Text-figs. 17-20.)

*I m a g o .*

Not known.

*S o l d i e r .* (Text-figs. 17-19.)

*Colour:* Head very dark, nearly black; antennae and anterior half of pronotum fuscous, remainder of pronotum and tergites of abdomen lighter; legs yellowish.

*Head:* In profile (Text-fig. 17) long and slender, with long slender snout; viewed from above (Text-fig. 18) the posterior part of the head is moderately wide and rounded with a marked constriction behind the antennae. Antennae (Text-fig. 19) 13-jointed, long and slender, longer than head, first joint long and slender, twice as long as second and fourth, second and fourth equal in length and shortest of all, fourth oval, third long and narrow, seven-tenths the length of first and a little longer than fifth, sixth and thirteenth elongate, sixth a little longer than seventh, eighth to tenth and thirteenth a little longer than sixth, nearly as long as first, eleventh and twelfth shorter than thirteenth, equal to seventh.

*Thorax:* Pronotum more than twice as wide as long, saddle-shaped, anterior half very dark, bent up and fringed with short stout hairs, lateral margins narrow and rounded, posterior margin semicircular; mesonotum narrower, shorter and more flattened than pronotum.

*Legs* very slender, not markedly long, moderately setaceous.

*Abdomen* elongate, clothed similarly to legs, cerci long and slender.

*Measurements:*

Total length (when axis of head is parallel with axis of body) 3.75 mm.

Head: long 1.22—1.30; wide 0.56; deep 0.37.

Thorax and abdomen, long 1.90—2.00.

Antennae (13-jointed), long 1.60.

Pronotum: long 0.18; wide 0.42.

Tibia iii. 0.84.

Abdomen, wide 0.80.

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Specimens in alcohol may be roughly distinguished from other described Australian species by the following obvious characters:—small size, long, slender, nearly black head and snout, long antennae, dark pronotum and brown banded abdomen.

*Worker.* (Text-fig. 20.)

*Colour:* Head light yellowish-brown with two broad parallel dark-brown stripes on either side of the whitish frontal suture and posterior to the transverse suture; labrum stramineous; antennae, mouth parts, thorax, legs and abdomen pale yellowish-white.

*Head* moderately broad, rounded behind; clypeus rather convex, without distinct longitudinal suture, sides straight, sloping to the broadly truncate apex; labrum very short and broad, less than half as long as wide, widening on the sides to the very broadly rounded apex. Antennae (Text-fig. 20) 15-jointed, third joint shortest, fourth and fifth equal, sixth a little longer than fourth and fifth.

*Thorax:* Pronotum saddle-shaped, as in soldier, but lateral margins are markedly produced.

*Legs* slender and rather short, moderately setaceous.

*Abdomen* with scanty clothing of fine setae of unequal lengths.

*Measurements:*

Total length 4.50 mm.

Head: long 1.40—1.60; wide 1.08—1.13.

Thorax and abdomen, long 3.33.

Pronotum: long 0.30; wide 0.70.

*Affinities.*—The nearest allies to the new species (soldiers) are *E. pulleinei* Mjöh. and *E. tyriei* Mjöh. From the former it is easily distinguished by its much darker head (dark reddish-orange in *E. pulleinei*) and by having only one form of soldier. From *E. tyriei* it is distinguished also by the colour of the head (dark reddish-orange in Mjöhberg's species), smaller size and very distinctly different antennae. It is the smallest of the very dark headed species yet described from Australia and the only one of such colour with constricted head.

*Locality.*—North Queensland: Mareeba (G. F. Hill, 23.5.21). Described from soldiers and workers found in a small, pointed mound of an undetermined species of *Hamitermes* in open Eucalyptus forest.

EUTERMES YARRABAHENSIS Mjöhberg. (Text-figs. 21-27.)

Arkiv for Zoologi, xii., No. 15, 1920, p. 53.

*Imago.* (Text-figs. 21-24.)

*Colour:* Head very dark brown, postclypeus and mandibles (excepting teeth) buckthorn brown, anteclypeus white, membranous; labrum yellow ochre; antennae and thorax buckthorn brown; wings brown, veins darker, anterior margin yellowish; tergites of abdomen brussels brown; first five sternites with obscure greyish spots at each end; legs buckthorn brown.

*Head* (Text-fig. 21) rather small, rounded behind to the posterior margin of the eyes, moderately densely setaceous. Eyes large (.517 x .400) and prominent, finely faceted, their lower margin close (.141) to lower margin of head. Ocelli oval, moderately large, inserted near eye (.047). Fontanelle large, elongate, forked anteriorly. Postclypeus a little more than twice as wide as long with scattered reddish setae. Anteclypeus as long as postclypeus, anterior margin

Specimens in alcohol may be roughly distinguished from other described Australian species by the following obvious characters:—small size, long, slender, nearly black head and snout, long antennae, dark pronotum and brown banded abdomen.

*Worker.* (Text-fig. 20.)

*Colour:* Head light yellowish-brown with two broad parallel dark-brown stripes on either side of the whitish frontal suture and posterior to the transverse suture; labrum stramineous; antennae, mouth parts, thorax, legs and abdomen pale yellowish-white.

*Head* moderately broad, rounded behind; clypeus rather convex, without distinct longitudinal suture, sides straight, sloping to the broadly truncate apex; labrum very short and broad, less than half as long as wide, widening on the sides to the very broadly rounded apex. Antennae (Text-fig. 20) 15-jointed, third joint shortest, fourth and fifth equal, sixth a little longer than fourth and fifth.

*Thorax:* Pronotum saddle-shaped, as in soldier, but lateral margins are markedly produced.

*Legs* slender and rather short, moderately setaceous.

*Abdomen* with scanty clothing of fine setae of unequal lengths.

*Measurements:*

Total length 4.50 mm.

Head: long 1.40—1.60; wide 1.08—1.13.

Thorax and abdomen, long 3.33.

Pronotum: long 0.30; wide 0.70.

*Affinities.*—The nearest allies to the new species (soldiers) are *E. pulleinei* Mjöh. and *E. tyriei* Mjöh. From the former it is easily distinguished by its much darker head (dark reddish-orange in *E. pulleinei*) and by having only one form of soldier. From *E. tyriei* it is distinguished also by the colour of the head (dark reddish-orange in Mjöhberg's species), smaller size and very distinctly different antennae. It is the smallest of the very dark headed species yet described from Australia and the only one of such colour with constricted head.

*Locality.*—North Queensland: Mareeba (G. F. Hill, 23.5.21). Described from soldiers and workers found in a small, pointed mound of an undetermined species of *Hamitermes* in open Eucalyptus forest.

EUTERMES YARRABAHENSIS Mjöhberg. (Text-figs. 21-27.)

Arkiv for Zoologi, xii., No. 15, 1920, p. 53.

*Imago.* (Text-figs. 21-24.)

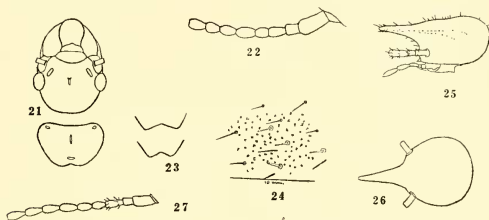
*Colour:* Head very dark brown, postclypeus and mandibles (excepting teeth) buckthorn brown, anteclypeus white, membranous; labrum yellow ochre; antennae and thorax buckthorn brown; wings brown, veins darker, anterior margin yellowish; tergites of abdomen brussels brown; first five sternites with obscure greyish spots at each end; legs buckthorn brown.

*Head* (Text-fig. 21) rather small, rounded behind to the posterior margin of the eyes, moderately densely setaceous. Eyes large (.517 x .400) and prominent, finely faceted, their lower margin close (.141) to lower margin of head. Ocelli oval, moderately large, inserted near eye (.047). Fontanelle large, elongate, forked anteriorly. Postclypeus a little more than twice as wide as long with scattered reddish setae. Anteclypeus as long as postclypeus, anterior margin

produced in the middle. Labrum narrow at the base, as wide as postclypeus in the middle, rounded in front and just reaching the apex of the mandibles. Antennae (Text-fig. 22) 16-jointed, the first joint large, longest of all, second half as long as first and much narrower, third as long as second, a little narrower at the apex and much narrower at the base, fourth shortest of all, fifth noticeably longer than third, sixth and seventh, the remaining joints not exceeding the fifth in length.

*Thorax*: Pronotum (Text-fig. 21) small, a little narrower than head, not notched, but slightly concave and bent up in front; antero-lateral areas rounded, sides sloping to the narrowed and slightly sinuate posterior margin, clothed as in head and wing-stumps. Meso- and metanotum (Text-fig. 23) with posterior margin deeply emarginate.

*Legs* short, moderately stout and setaceous, claws long and slender, spurs 2:2:2.



Text-figs. 21-27. *Eutermes yarrabahensis* Mjöberg.

21-24. Imago.—21. Head and pronotum; 22. Antenna, proximal segments; 23. Meso- and metanotum, posterior margin; 24. Wing-membrane.  
25-27. Soldier.—25. Head in profile; 26. Head, dorsal surface; 27. Antenna, proximal segments.

*Wings*: Wing-stumps small, equal, clothed with long and short setae, suture straight; costa and radius very distinct at the base but soon becoming obscure, with three or four branches beyond the middle; cubitus with nine or ten branches, the first six only very distinct. Wing-membrane (Text-fig. 24) minutely and densely sculptured, clothed densely with minute setae.

*Abdomen* large, clothed as in pronotum; cerci short and stout.

*Measurements*:

Length with wings: ♂ 16.00 mm., ♀ 18.50; without wings: ♂ 8.00, ♀ 10.50.

Head: wide 1.60—1.69; long 1.88—2.00; deep 0.70.

Antennae (16-jointed) 2.60.

Pronotum: long 0.84—0.94; wide 1.50—1.55.

Wings: fore, long 15.00, wide 4.60; hind, long 14.50, wide 5.00.

Tibia iii. 2.00.

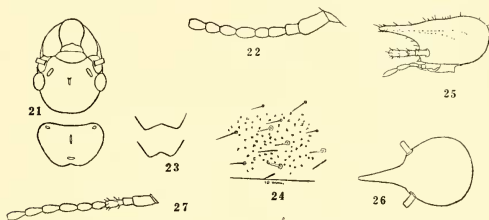
Abdomen, wide 3.00—3.50.

*Affinities*.—The imago of this species is very similar to that of *E. vernoni*, n.sp., but is easily separated by its smaller size, much smaller wings and eyes, light coloured thorax, etc.

produced in the middle. Labrum narrow at the base, as wide as postclypeus in the middle, rounded in front and just reaching the apex of the mandibles. Antennae (Text-fig. 22) 16-jointed, the first joint large, longest of all, second half as long as first and much narrower, third as long as second, a little narrower at the apex and much narrower at the base, fourth shortest of all, fifth noticeably longer than third, sixth and seventh, the remaining joints not exceeding the fifth in length.

*Thorax*: Pronotum (Text-fig. 21) small, a little narrower than head, not notched, but slightly concave and bent up in front; antero-lateral areas rounded, sides sloping to the narrowed and slightly sinuate posterior margin, clothed as in head and wing-stumps. Meso- and metanotum (Text-fig. 23) with posterior margin deeply emarginate.

*Legs* short, moderately stout and setaceous, claws long and slender, spurs 2:2:2.



Text-figs. 21-27. *Eutermes yarrabahensis* Mjöberg.

21-24. Imago.—21. Head and pronotum; 22. Antenna, proximal segments; 23. Meso- and metanotum, posterior margin; 24. Wing-membrane.  
25-27. Soldier.—25. Head in profile; 26. Head, dorsal surface; 27. Antenna, proximal segments.

*Wings*: Wing-stumps small, equal, clothed with long and short setae, suture straight; costa and radius very distinct at the base but soon becoming obscure, with three or four branches beyond the middle; cubitus with nine or ten branches, the first six only very distinct. Wing-membrane (Text-fig. 24) minutely and densely sculptured, clothed densely with minute setae.

*Abdomen* large, clothed as in pronotum; cerci short and stout.

*Measurements*:

Length with wings: ♂ 16.00 mm., ♀ 18.50; without wings: ♂ 8.00, ♀ 10.50.

Head: wide 1.60—1.69; long 1.88—2.00; deep 0.70.

Antennae (16-jointed) 2.60.

Pronotum: long 0.84—0.94; wide 1.50—1.55.

Wings: fore, long 15.00, wide 4.60; hind, long 14.50, wide 5.00.

Tibia iii. 2.00.

Abdomen, wide 3.00—3.50.

*Affinities*.—The imago of this species is very similar to that of *E. vernoni*, n.sp., but is easily separated by its smaller size, much smaller wings and eyes, light coloured thorax, etc.

*Identification.*—A comparison of a long series of soldiers and workers from several localities near Townsville with co-types kindly placed at my disposal by Professor Sjöstedt, leaves little doubt in my mind as to the correctness of the identification of the imago described in the preceding pages. In the colour, size and form of the heads of soldiers I can find no differences whatever, but there is a marked tendency in nearly all of my specimens to a coalescence of joints three and four of the antennae. This is rare in Palm Island examples, but, with few exceptions, it is the rule in all others. The workers appear to agree in every detail.

#### *Biology.*

*Termitaria.*—The termitaria are generally conical in shape, circular at the base, sloping symmetrically on the sides to the bluntly pointed or rounded apex. An average size nest measures about 15 inches in diameter at the base and about 18 to 20 inches in height. Larger nests, up to about 2 feet in height, are sometimes found. They appear to be constructed invariably on sandy, well-drained open forest or scrub country, or on low sandy rises near the margin of plains subjected to inundation. In the latter localities they are commonly found amongst the stumps of *Pandanus*. The material used in the construction of these nests appears to be composed entirely of sand firmly cemented together. In the older nests the walls are fairly hard and solid, but in the majority the whole mass is rather fragile and easily crumbled. The interior is composed of a multitude of small passages and cells, which sometimes contain eggs and small stores of grass, but are generally occupied exclusively by the insects. There is no well-defined "nursery," and no queen cell in the superstructure. A queen has not been found, but it is certain that she is not domiciled above ground-level. Below the termitarium the earth is tunnelled out to a depth of about 18 inches, forming galleries and cells similar to those above, and, doubtless, others for the accommodation of the queen and young larvae.

Prosperous colonies have been found in the walls of nests of *Coptotermes acinaciformis* Frogg. on Magnetic Island, and, on many occasions, under logs and in the soil on treeless grazing land near Townsville. The presence of the latter are generally easily detected by numerous short covered-ways which are constructed on the surface of the ground by foraging parties in search of food (grass). An exit is first made by cutting a curved slit in the surface soil about 3 mm. wide by 10 mm. long which is then covered with an arched roof of particles of sand cemented together. The covered-ways branch out in all directions to a distance of a foot or more and afford protection for the working party. Food appears to be gathered only at night. The underground nests of these colonies have not been examined, but it is probable that they are extensive, since it is definitely known that imagos are reared in them.

*Swarming.*—Nymphs with well-developed wing-pads, and also some mature imagos, were found in many nests on Magnetic Island on 26th November, 1920, and near Pentland on 1st December, 1921, whilst many imagos were captured at a lamp indoors in Townsville on 24th and 26th December, 1920, 15th and 21st January, 26th, 29th, and 31st December, 1921. The nests which contained nymphs and imagos on 26th November, 1920, contained none of these forms on 10th February, 1921.

*Locality.*—The type locality is Yarrabah, near Cairns, N. Queensland. The following additional N. Queensland localities may be added:—Palm Island, Magnetic Island, Cape Cleveland, Townsville (G.F.H.) Proserpine (J. F. Illingworth), Pentland (G. F. Cook), Prairie (J. R. Chisholm).

*Identification.*—A comparison of a long series of soldiers and workers from several localities near Townsville with co-types kindly placed at my disposal by Professor Sjöstedt, leaves little doubt in my mind as to the correctness of the identification of the imago described in the preceding pages. In the colour, size and form of the heads of soldiers I can find no differences whatever, but there is a marked tendency in nearly all of my specimens to a coalescence of joints three and four of the antennae. This is rare in Palm Island examples, but, with few exceptions, it is the rule in all others. The workers appear to agree in every detail.

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## EUTERMES LONGIPENNIS Hill. (Plate xxiv., fig. 2.)

Proc. Linn. Soc. N.S.W., xl., 1915, p. 104.

The type locality for this species is Koolpingah Station, about 30 miles S.E. of Darwin, N.T. A recent examination of a large number of nest-series shows that it occurs commonly in the vicinity of Darwin and Stapleton (69 miles south of Darwin), generally on low-lying, stiff grey or black soils. It is a pest of considerable importance, since it readily attacks fence-posts, house-blocks and bridge piles in badly-drained heavy soils. In such localities one frequently finds fence-posts and dead stumps of trees felled by timber-cutters encased in a hard clayey sheath, which is carried over the top to form a conical apex (Pl. xxiv., fig. 2). As the work of destruction proceeds, the entire mass of wood is replaced by a column of hard clay and triturated wood, which is easily pushed over but not readily crumbled. I have not found a queen in any of the nests examined. Fully developed alate forms were found in the nests from 6th to 21st November, when there were generally present a number of nymphs in the stage preceding the final moult. The latter doubtless mature rapidly, as is known to be the case in many other species, and leave the colony with the earlier developed winged individuals soon after the first heavy rains.

"Swarming" has not been observed, nor have the imagoes been captured in the free-living state.

## HAMITERMES DARWINI, n.sp. (Text-figs. 28-33.)

*Imago.*

Not known.

*Soldier.* (Text-figs. 28-31.)

*Colour:* Head xanthine orange with broad ochraceous orange area extending from the front posteriorly; labrum mustard yellow; mandibles mahogany, shading at base to the colour of head; mouth parts, antennae, legs and pronotum yellow ochre; abdomen greyish, due to contents of stomach.

*Head* (Text-figs. 28, 29) large, broadly rounded behind, slightly rounded on the sides, widest about the middle, bearing very few stout reddish setae, chiefly on the front. Clypeus large, about two-fifths as long as wide, slightly emarginate in front, divided by a deep and wide median furrow, which passes into the frons. Labrum large, wide at base, slightly rounded on the sides to the broadly rounded apex, which hardly covers the mandibular teeth, bearing about 14 long reddish setae. Mandibles very long, falciform, broad at the base, each with a large tooth in line with the apex of the labrum. Gula at narrowest part about one fourth the width of head. Antennae (Text-figs. 30, 31): First joint very large, second about half as long as, and much narrower than, first, both without setae, third half as long and about as wide as second, shortest of all; fourth very little larger than fifth, sixth a little larger than fourth, seventh to fourteenth elongate.

*Prothorax* very small, much narrower than head, anterior half bent up, front margin semicircular, with faint indication of notch in middle; antero-lateral area narrowed, sides sloping into the truncate posterior margin; margin with scanty fringe of long reddish setae.

*Legs* moderately short, femora and fore-tibiae slightly thickened, with few setae; apical one-third of tibiae with long stout setae on posterior margin, tibial spurs 3:2:2.

## EUTERMES LONGIPENNIS Hill. (Plate xxiv., fig. 2.)

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*Head* (Text-figs. 28, 29) large, broadly rounded behind, slightly rounded on the sides, widest about the middle, bearing very few stout reddish setae, chiefly on the front. Clypeus large, about two-fifths as long as wide, slightly emarginate in front, divided by a deep and wide median furrow, which passes into the frons. Labrum large, wide at base, slightly rounded on the sides to the broadly rounded apex, which hardly covers the mandibular teeth, bearing about 14 long reddish setae. Mandibles very long, falciform, broad at the base, each with a large tooth in line with the apex of the labrum. Gula at narrowest part about one fourth the width of head. Antennae (Text-figs. 30, 31): First joint very large, second about half as long as, and much narrower than, first, both without setae, third half as long and about as wide as second, shortest of all; fourth very little larger than fifth, sixth a little larger than fourth, seventh to fourteenth elongate.

*Prothorax* very small, much narrower than head, anterior half bent up, front margin semicircular, with faint indication of notch in middle; antero-lateral area narrowed, sides sloping into the truncate posterior margin; margin with scanty fringe of long reddish setae.

*Legs* moderately short, femora and fore-tibiae slightly thickened, with few setae; apical one-third of tibiae with long stout setae on posterior margin, tibial spurs 3:2:2.



*Abdomen* small, widest in the middle, pointed towards the apex, with scanty pale long setae.

*Measurements:*

Total length 4.25 mm.

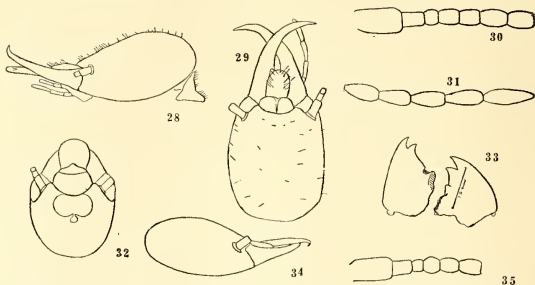
Head: with jaws, long 2.35; from base to apex of labrum 1.88; wide 1.22—1.36; deep 0.89.

Antennae (15-jointed) long 1.88.

Pronotum: long .37; wide .70.

Tibia iii., long 1.22.

Abdomen, wide 1.17.



Text-figs. 28-33. *Hamitermes darwini*, n.sp.

28-31. Soldier.—28. Head in profile; 29. Head, dorsal surface; 30. Antenna, proximal segments; 31. Antenna, distal segments.

32-33. Worker.—32. Head; 33. Mandibles.

Text-figs. 34-35. *Hamitermes meridionalis* Froggatt.

Soldier.—34. Head in profile (to same scale as fig. 28); 35. Antenna, proximal segments (same scale as fig. 30).

*Worker.* (Text-figs. 32, 33.)

*Colour:* Head yellow ochre, suffused with ochraceous orange on sides; clypeus and labrum yellow ochre; frons cream; remainder of insect buff yellow.

*Head* (Text-fig. 32) small, semicircular behind, widening slightly on the sides to the base of the mandibles, antennal fossae wide and shallow, foveolae much closer to the postero-lateral angle of the clypeus than to the lateral margin of the head, the surface with very few, moderately long, reddish setae. Post-clypeus large, half as long as wide, convex, broadly rounded behind, truncate in front, with a distinct suture. Labrum short and wide, rounded in front. Antennae 15-jointed, third joint shortest. Mandibles as in Text-fig. 33.

*Pronotum* as in soldier, but without notch in anterior margin.

*Legs* short and stout, femora and fore-tibiae thickened, long stout setae on the posterior margin of the apical one-third of tibiae; tibial spurs 3:2:2.

*Abdomen* small, widest in the middle, pointed towards the apex, with scanty pale long setae.

*Measurements:*

Total length 4.25 mm.

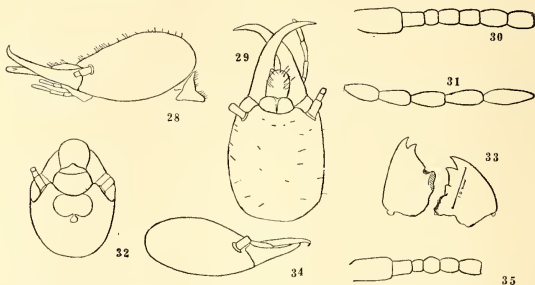
Head: with jaws, long 2.35; from base to apex of labrum 1.88; wide 1.22—1.36; deep 0.89.

Antennae (15-jointed) long 1.88.

Pronotum: long .37; wide .70.

Tibia iii., long 1.22.

Abdomen, wide 1.17.



Text-figs. 28-33. *Hamitermes darwini*, n.sp.

28-31. Soldier.—28. Head in profile; 29. Head, dorsal surface; 30. Antenna, proximal segments; 31. Antenna, distal segments.

32-33. Worker.—32. Head; 33. Mandibles.

Text-figs. 34-35. *Hamitermes meridionalis* Froggatt.

Soldier.—34. Head in profile (to same scale as fig. 28); 35. Antenna, proximal segments (same scale as fig. 30).

*Worker.* (Text-figs. 32, 33.)

*Colour:* Head yellow ochre, suffused with ochraceous orange on sides; clypeus and labrum yellow ochre; frons cream; remainder of insect buff yellow.

*Head* (Text-fig. 32) small, semicircular behind, widening slightly on the sides to the base of the mandibles, antennal fossae wide and shallow, foveolae much closer to the postero-lateral angle of the clypeus than to the lateral margin of the head, the surface with very few, moderately long, reddish setae. Post-clypeus large, half as long as wide, convex, broadly rounded behind, truncate in front, with a distinct suture. Labrum short and wide, rounded in front. Antennae 15-jointed, third joint shortest. Mandibles as in Text-fig. 33.

*Pronotum* as in soldier, but without notch in anterior margin.

*Legs* short and stout, femora and fore-tibiae thickened, long stout setae on the posterior margin of the apical one-third of tibiae; tibial spurs 3:2:2.

*Abdomen* short and broad, nota with scattered moderately long setae.

*Measurements:*

Total length 4.25 mm.

Head: long 1.55; wide 1.22.

Thorax and abdomen, long 3.80.

Antennae (15-jointed) 1.64.

Pronotum: long .42; wide .70.

Tibia iii., long 1.03.

Abdomen, wide 1.78.

This species is described from three series of soldiers and workers, (a) from amongst the surface roots of grass (1st April), (b) in an abandoned nest of *Eutermes pastinator* Hill (1st January), (c) in heavily manured garden soil (16th October). It is probably a common species in the type locality, but owing to its cryptic habits it is likely to be found only by chance.

*Affinities.*—In colour the soldier is very like that of *H. meridionalis* Frogg., but it is a much more robust species (compare Text-figs. 28 and 34, which are drawn to same scale) with distinctly different mandibles. From *H. germanus* Hill it is easily distinguished by its greater size and the form of the mandibles, especially the relative proximity of the mandibular tooth to the base of the jaw. *H. kimberleyensis* Mjög. is much nearer to *H. germanus* Hill than to the new species, with which it cannot be confused.

*Locality.*—Northern Territory: Darwin (G. F. Hill).

HAMITERMES GERMANUS Hill. (Plate xxv., fig. 1; Text-figs. 36-41.)

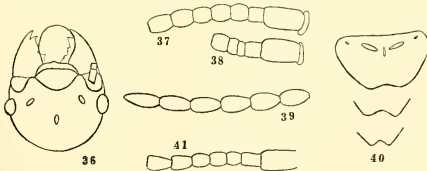
*Termes germana*, Hill, Proc. Linn. Soc. N.S.W., xl, 1915, p. 88.

*Hamitermes germanus*, Hill, Bull. Ent. Res., xii, No. 4, 1922.

*Imago.* (Pl. xxv., fig. 1; Text-figs. 36-40.)

*Colour:* Head dark auburn, thorax and tergites of abdomen argus brown; labrum yellowish; postclypeus, mouth-parts, antennae, legs, and under-surface yellow ochre; pleurae brown; wings dark fuliginous with dark brown veins.

*Head* (Text-fig. 36) small, rounded behind to the posterior margin of the eyes, flattened in front, densely setaceous. Labrum rather small, swollen on the sides to the semicircular anterior margin, setaceous. Anteclypeus small, hyaline;



Text-figs. 36-41. *Hamitermes germanus* Hill.

36-40. Imago.—36. Head; 37. Antenna, proximal segments; 38. Antenna, proximal segments of another form; 39. Antenna, distal segments; 40. Pronotum and posterior margin of meso- and metanotum.

41. Soldier.—Antenna, proximal segments.

*Abdomen* short and broad, nota with scattered moderately long setae.

*Measurements:*

Total length 4.25 mm.

Head: long 1.55; wide 1.22.

Thorax and abdomen, long 3.80.

Antennae (15-jointed) 1.64.

Pronotum: long .42; wide .70.

Tibia iii., long 1.03.

Abdomen, wide 1.78.

This species is described from three series of soldiers and workers, (a) from amongst the surface roots of grass (1st April), (b) in an abandoned nest of *Eutermes pastinator* Hill (1st January), (c) in heavily manured garden soil (16th October). It is probably a common species in the type locality, but owing to its cryptic habits it is likely to be found only by chance.

*Affinities.*—In colour the soldier is very like that of *H. meridionalis* Frogg., but it is a much more robust species (compare Text-figs. 28 and 34, which are drawn to same scale) with distinctly different mandibles. From *H. germanus* Hill it is easily distinguished by its greater size and the form of the mandibles, especially the relative proximity of the mandibular tooth to the base of the jaw. *H. kimberleyensis* Mjög. is much nearer to *H. germanus* Hill than to the new species, with which it cannot be confused.

*Locality.*—Northern Territory: Darwin (G. F. Hill).

HAMITERMES GERMANUS Hill. (Plate xxv., fig. 1; Text-figs. 36-41.)

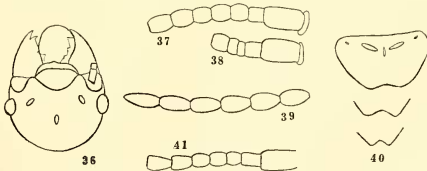
*Termes germana*, Hill, Proc. Linn. Soc. N.S.W., xl, 1915, p. 88.

*Hamitermes germanus*, Hill, Bull. Ent. Res., xii, No. 4, 1922.

*Imago.* (Pl. xxv., fig. 1; Text-figs. 36-40.)

*Colour:* Head dark auburn, thorax and tergites of abdomen argus brown; labrum yellowish; postclypeus, mouth-parts, antennae, legs, and under-surface yellow ochre; pleurae brown; wings dark fuliginous with dark brown veins.

*Head* (Text-fig. 36) small, rounded behind to the posterior margin of the eyes, flattened in front, densely setaceous. Labrum rather small, swollen on the sides to the semicircular anterior margin, setaceous. Anteclypeus small, hyaline;



Text-figs. 36-41. *Hamitermes germanus* Hill.

36-40. Imago.—36. Head; 37. Antenna, proximal segments; 38. Antenna, proximal segments of another form; 39. Antenna, distal segments; 40. Pronotum and posterior margin of meso- and metanotum.

41. Soldier.—Antenna, proximal segments.

postclypeus large, about twice as wide as long, semicircular behind, truncate in front, setaceous. Eyes small (.208 x .272), projecting very little, separated from the lower margin of the head by a space equal to about half their short diameter. Ocelli small, oval, separated from the eyes by a distance equal to that separating the eye from the lower margin of head. Fontanelle large, elongate oval. Antennae (Text-figs. 37-39) 15- or 16-jointed, variable in segmentation, sometimes differing markedly in the same individual, the first always short and stout, second always very short and narrow, sometimes shortest of all, third generally shortest and narrowest but often equal to second and fourth.

*Thorax* (Text-fig. 40): Pronotum small, narrower than head, straight in front, with an oblique, elongate depression on either side near the median line and a smaller one in each antero-lateral area, sides rounded to the emarginate posterior margin, densely setaceous. Meso- and metanotum with posterior margin markedly sinuate.

*Legs* short, moderately stout and setaceous; tibial spurs 3:2:2.

*Wings*: Wing-stumps clothed with long and short setae, suture straight. Wings long and narrow, veins distinct to the wing-margin, margin very setaceous; membrane setaceous and densely sculptured. Venation slightly variable but generally as shown in Plate xxv., fig. 1. Rudiment of subcosta visible beyond cross suture.

*Abdomen* widest in the middle, rounded at the apex, densely clothed with long and short pale setae; cerci very small.

*Measurements*:

Length: with wings 12.5—13.0 mm.; without wings 6.5—7.0.

Head: long 1.50; wide 1.08; deep 0.47.

Antennae (15-16-jointed) 1.88.

Pronotum: long .61; wide .98.

Wings: fore, long 10.00, wide 2.63; hind, long 9.50, wide 2.77.

Tibia iii, long 1.17.

Abdomen, wide 1.41.

*Identification*.—The identification of the alate form described above is based on the comparison of soldiers and workers associated with them, with the types of these castes (from the same locality).

*Biology*.

On the 17th and 20th November, 1914, immense numbers of alate termites were seen to rise from the ground during and just after a driving rainstorm, which swept over the town about 2.30 p.m. The "swarm" was found to be issuing from many small, circular openings in the surface of the soil over an area of about 20 feet in diameter. Soldiers and workers poured out with the winged forms and, like them, soon became a prey to ants and lizards, which had appeared with their customary promptness. The exit holes were guarded by other soldiers and workers as long as "swarming" lasted, after which the latter closed the openings with cement-like material, leaving many of their fellows to perish in their struggles with their enemies. Examples of all castes were collected at the exit holes only to obviate the possibility of confusing them with another species (*H. darwini*, n.sp.) which was known to infest the same allotment. An attempt was made to follow the underground tunnels back to their nest, but this was found impracticable. This species, like *H. germanus* Hill and *H. darwini*, n.sp., appears to feed exclusively on decaying vegetable matter. None of them, as far as known, build termitaria.

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## HAMITERMES WILSONI, nov. nomen.

*Hamitermes perplexus* Hill (*nee* Banks) Bull. Ent. Research, xii, No. 4, 1922; Proc. Linn. Soc. N.S.W., xvi., 1921, p. 453.

Dr. T. E. Snyder, Bureau of Entomology, Washington, has been kind enough to point out to me that the name given to this species is preoccupied, having been used by Banks (1920) for a species from Texas. I now propose to name it after Mr. F. E. Wilson, to whom I am indebted for many examples of the termite fauna of Victoria.

## COPTOTERMES ACINACIFORMIS Froggatt. (Plate xxv., figs. 2, 3.)

Proc. Linn. Soc. N.S.W., xxii., 1897, p. 740 (Termes); Hill, *op. cit.*, xl, 1915, p. 92.

I have examined a large number of nest series, many of which include queens or alate imagos, or both, from North Queensland, Northern Territory, and adjacent islands, and have compared them with co-type soldiers and imagos of *C. acinaciformis* Frogg. (imago de-alated) and *C. lacteus* Frogg. Mr. Froggatt had previously identified Northern Territory specimens for me as *C. acinaciformis* and I am now satisfied that this is the common, if not the only, species of this genus found in the northern (coastal) region of the Territory. I have previously described the habits of this species in the Northern Territory (Hill, 1915), but I may add that later investigations show that neotenic queens are produced as substitutes for "first form," or true queens, if the latter be removed from prosperous termitaria.

Since the above paper was written I have been fortunate enough to secure complete nest series of *Coptotermes* from Bathurst Island (N.T.) and Moa Island (Torres Strait), which show clearly that the island species is quite distinct in the imago from any of the described mainland species. Whether or not the Melville Island specimens, previously referred to *C. acinaciformis*, are conspecific with those from the islands mentioned, must remain in doubt until imagos are available for study. A number of soldiers and workers from a house-pile at Membare River (New Guinea) represent still another species, while a similar set from Mitchell River (N.Q.) appears to differ from other N. Queensland specimens. From Townsville (N.Q.) I have complete series, including alate imagos and queens, which I refer to *C. acinaciformis* Frogg. Other sets from North Queensland (Malanda, Port Douglas, Palm Island and Magnetic Island) appear to be referable to the same species, but in the absence of imagos, specific determination cannot be made with confidence. *C. michaelsoni* Silv. which has been recorded by Mjöberg (1920) from Cedar Creek and Herberston (N.Q.) is unknown to me from N. Australia, as is *C. lacteus* Frogg. recorded by Mjöberg from Millaa Millaa, Laura, and Aliee River (N.Q.). To the latter species I provisionally refer soldiers and workers from Pikedale, S.Q.

In the paper previously referred to, I have described the termitaria and habits of this species, which appear to be very similar to those of *C. lacteus* as described by Froggatt. The mounds are very characteristic in the genus, inasmuch as they consist of a clayey outer wall covering a compact mass of comminuted woody matter moulded into a curiously complicated form reminding one of the familiar jig-saw puzzles (Pl. xxv., figs. 2, 3).

This species is undoubtedly the most destructive of all to standing timber, and in many localities few Eucalypts escape attack. Fortunately only the centre

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of the tree suffers for many years, so that the actual loss in timber felled for splitting is not great. I have, however, seen some very fine timber rendered valueless for bridge-building and other heavy work, which was otherwise suitable for the purpose. Although capable of doing so much damage to the hardest woods, I have rarely found them destroying fences or buildings.

COPTOTERMES RAFFRAYI Wasmann.

Proc. Linn. Soc. N.S.W., xxv., 1900; Hill, *op. cit.*, xvi., 1921, p. 263.

In a recent paper (1921) I described the alate form of the above species from a nest series collected in the type locality (S.W. Australia), the identification having been made from the original descriptions of the soldier and worker castes. This identification has since been confirmed by Rev. Father Wasmann after comparison of my material with the types.

In referring to the affinities of this species, I stated that the alate form of *C. michaelseni* Silv. is unknown, whereas a full description appears in Professor Silvestri's paper (1909). The differences in both the alate and soldier caste are so marked that the two species cannot be confused.

*Reference in addition to those quoted in the text.*

LIGHT, S. F., 1921.—Notes on Philippine Termites, ii. *Philippine Journ. Sci.*, xix., No. 1, pp. 23-61.

EXPLANATION OF PLATES XXIII.-XXV.

Plate xxiii.

*Eutermea vernoni*, n.sp.

- Fig. 1. Termitarium opened to show "nursery" in the middle, and position of queen (at point of forceps). The scale in middle of "nursery" is 4 inches long.
- Fig. 2. Close view of a similar termitarium. Queen in the "nursery," below left end of scale. Stores of grass near outer walls.

Plate xxiv.

- Fig. 1. A group of termitaria of *Eutermea vernoni*, n.sp., *Hamitermea wilsoni* Hill and *Drepanotermea silvestrii* Hill.
- Fig. 2. Termitarium of *Eutermea longipennis* Hill built over stump.

Plate xxv.

*Hamitermea germanus* Hill.

- Fig. 1. Fore- and hind-wings.
- Coptotermea acinaciformis* Froggatt.
- Fig. 2. Termitarium on side of hill (Townsville, N.Q.).
- Fig. 3. Interior of termitarium, showing partly destroyed tree stump (Darwin, N.T.).

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